



Water Softeners add Comfort and Cost Water

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Title:

Water Softeners add Comfort and Cost Water

Summary (improved version):

Water softeners provide various benefits and have water loss as a downside. The amount of water consumed by a water softening system will vary depending amongst others on the softening technology and size of the system. Water softening systems can be implemented at a water treatment plant by the water utility, the so-called centralised drinking water softening (relatively large size), or as a home water treatment system by the consumer (predominantly small size).

Hard drinking water can be undesirable from a human health, environmental, socioeconomic and aesthetic point of view. Hard water increases the use of soap and detergents and has an increased tendency of calcium carbonate scaling (lime scaling) on surfaces in contact with the water. Lime scaling can decrease the service life of household appliances and installations, and increase both the energy consumption by household installations (e.g. kettles and heating elements) and the use of descaling agents. Avoiding these effects can lead to both socioeconomic and environmental benefits. Hard water in most cases has a relatively low pH value and might contain high hydrogen carbonate and sulphate concentrations, and in this case consequently has an increased solubility of copper and lead. This may cause leaching from copper and lead containing pipe materials and exceedance of guideline concentrations. Centralised drinking water softening therefore is an effective and efficient lead and copper control strategy. However, reducing the water hardness too much may lead to drinking water that is corrosive towards steel and cast iron piping material.

Several softening technologies exist with different mechanisms for hardness removal including precipitation, ion exchange and membrane separation. In addition, each softening technology has multiple design options depending on e.g. the choice of softening chemical and membrane type. All softening technologies reduce water hardness but the benefits and downsides vary depending on the removal mechanism and process design. Selection of the most appropriate softening technology for both large and small size implementation therefore requires comparison and evaluation in a holistic framework including economic, societal, technical and environmental aspects.

A holistic comparison of water softening technologies is since early 2017 under development at the Department of Environmental Engineering of the Technical University of Denmark, using the long-term experiences with different softening technologies applied in full-scale in the Netherlands, Flanders and Denmark.

Our presentation will showcase the available softening technologies and their most recent developments, and will highlight the strengths and weaknesses of the different technologies thereby specifically addressing the environmental benefits and downsides, i.e. the water consumption of a water softening system. A procedure for comparing and evaluating different softening technologies will also be offered, thereby facilitating a more optimal technology selection and decision making.

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Best Management Practices

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